Claims

[c1] *1.*A topology loop detection mechanism, for a network, comprising:
sending out a loop detection frame; and
detecting a topology loop.

[c2] *2.*The topology loop detection mechanism as recited in claim 1, wherein the loop detection frame comprises a plurality of fields, the fields at least comprising:
a Destination Media Access Control (DMAC) address; and
a Source Media Access Control (SMAC) address.

[c3] *3.*The topology loop detection mechanism as recited in claim 2, wherein the DMAC address is
01–80–c2–00–00–2f.

[c4] *4.*The topology loop detection mechanism as recited in claim 2, wherein the DMAC address is a Media Access Control (MAC) address of a local switch with anI/G bit set.

[c5] *5.*The topology loop detection mechanism as recited in claim 2, wherein the SMAC address is the MAC address of a local switch with the I/G bit cleared.

[c6] 6.The topology loop detection mechanism as recited in claim 2, wherein the loop detection frame further comprises a type/length, which carries a length of the loop detection frame.

[c7] 7.The topology loop detection mechanism as recited in claim 2, wherein the loop detection frame further comprises a SNAP.

[c8] 8.The topology loop detection mechanism as recited in claim 2, wherein the loop detection frame further comprises a message, including a plurality of Type–Length–Value (TLV) fields.

[c9] 9.The topology loop detection mechanism as recited in claim 8, wherein the loop detection frame further comprises a TLV field, which including:
a terminator, for signifying an end of a message and extend the loop detection frame to particular size and byte alignment;
a port identifier, for determining whether the local switch is part of the topology loop or the topology loop resides remotely;
a VLAN identifier, for the loop detection frames" originator not being identified because the VLAN or its derived information is not available to a loop detection software module;

a switch identifier, for the loop detection frames" originator not being identified from the DMAC address or the SMAC address;

a timestamp, for identifying how long the loop detection frame has lingered, being against a replay attack; and

a checksum, for authenticating the loop detection frame, being against a faked loop detection frame from interfering with the network.

[c10]   10. The topology loop detection mechanism as recited in claim 1, wherein the detecting of the topology loop comprises:

a transmission procedure;

a reception and forwarding procedure;

an analysis procedure; and

an action procedure.

[c11]   11. The topology loop detection mechanism as recited in claim 10, wherein the transmission procedure comprising:

a first transmission algorithm, emphasizing the balance between fast detection, non-excessive load, and fairness to all the VLANs or a plurality of ports, comprising:

all the ports of the local switch being candidates for the transmission of the loop detection frame on every second, and

sending out the loop detection frame on the VLANs un-

der test on each the port, which are in a forwarding states for up to fifty such the VLANs which are treated fairly; and

a second transmission algorithm, comprising:

all the VLANs of the local switch in action being candidates for loop detection transmission on every second, and

sending one the loop detection frame on all the ports in an topology in action of the VLAN up to fifty the VLANs on each of the VLANs.

[c12]   *12.*The topology loop detection mechanism as recited in claim 11, wherein the second transmission algorithm requires a detecting time of the topology loop between 1 to 80 seconds.

[c13]   *13.*The topology loop detection mechanism as recited in claim 10, wherein the reception and forwarding procedure comprise:

receiving the loop detection frame on a forwarding port on the topology in action,

the local switch forwarding the loop detection frame unmodified to all other the ports on the topology in active if not originating the frame, and

discarding the loop detection frame and ought not forward the loop detection frame further when the local switch receiving the loop detection frame on a blocking

port.

14.The topology loop detection mechanism as recited in claim 10, wherein the analysis procedure comprises: determining the topology loop if the port originating the loop detection frame and the port receiving the loop detection frame are both in forwarding states; the local switch being part of the topology loop if the ports being in different the ports; and the topology loop residing remotely if the ports being the same port.

15.The topology loop detection mechanism as recited in claim 10, wherein the action procedure for stopping the topology loop if detected comprising: blocking the port originating the loop detection frame if a unidirectional link occurs; alarming the end-user to implement a remedy if detecting a remote topology loop; and resuming operation automatically after a timer expiry.

16.The topology loop detection mechanism as recited in claim 15, wherein the blocked port due to loop detection resumes operation automatically after the timer expiry, so that end-users do not need to access the switch to do that

[c17]   17. The topology loop detection mechanism as recited in claim 1, wherein the topology loop is detected upon detecting a STP related problem, wherein the topology loop forms when the local switch opens up the blocking port to the forwarding port by mistake.

[c18]   18. The topology loop detection mechanism as recited in claim 1, wherein the topology loop is detected upon detecting a unidirectional link, wherein port hardware is stuck at a transmission logic or at a receiving logic.

[c19]   19. The topology loop detection mechanism as recited in claim 1, wherein the topology loop is detected upon detecting a link aggregation, wherein two sides of links have different the link aggregations.

[c20]   20. The topology loop detection mechanism as recited in claim 1, wherein the topology loop is detected upon detecting VLAN translation, wherein assignments to VLAN on the ports are inconsistent.

[c21]   21. The topology loop detection mechanism as recited in claim 1, wherein the topology loop is detected upon detecting bridging among a plurality of L3 interfaces, wherein a router allows bridging of the loop detection frame among the L3 interfaces that changes the assigned VLAN of the bridged loop detection frames.

[c22] 22.The topology loop detection mechanism as recited in claim 1, wherein the detecting the topology loop is done by enabling the local switch that is located where the topology loop potentially exists.

[c23] 23.The topology loop detection mechanism as recited in claim 1, wherein the local switch MAC address with the I/G bit is set as the DMAC address for reducing CPU load.

[c24] 24.The topology loop detection mechanism as recited in claim 1, wherein the port is disabled by default, the port featuring disabled receives or forwards the loop detection frames, and the port featuring enabled sends out the loop detection frames and is blocked when the topology loop is detected.

[c25] 25.The topology loop detection mechanism as recited in claim 1, wherein the topology loop detection mechanism is independent of a switch"s capa'ility of detecting a topology loop.

[c26] 26.The topology loop detection mechanism as recited in claim 1, wherein the topology loop detection mechanism allows any checksum/authentication algorithm.